Remarks

These remarks are submitted in response to the Office Action of December 22, 2010. No new matter has been added.

I. Claim Rejections Under 35 U.S.C § 112

Claims 1, 3, 7-11, 24, 25 and 32-42 are rejected under 35 U.S.C. 112, second paragraph, as purportedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In particular, the Office Action asserts that it is unclear what steps would be taken to adjust only one of the metal oxide materials during the mixing. Claims 1, 32 and 41 have been amended to clarify the steps of mixing, sintering, forming, measuring and adjusting, and then repeating those steps to change the dielectric constant of the formed electronically tunable dielectric material to a desired dielectric constant while maintaining the tunability and the dielectric loss of the formed electronically tunable dielectric material substantially the same. It is respectfully submitted that these method claims recite steps for making an electronically tunable dielectric material by adjusting an amount of only one metal oxide material of the at least two additional metal oxide materials for a subsequent mixing step. These steps are entitled to patentable weight, and particularly point out and distinctly claim the patentable process for making an electronically tunable dielectric material.

Support for the claim amendments can be found at least at paragraphs 45-46 of the Specification:

> [0045] As shown in Tables 1-5, the dielectric constant can be tailored by changing the percentage of one phase while maintaining the tunability and dielectric loss. An example of this is shown in Table 1, where changing the percentage of the Mg_2SiO_4 phase in the BSTO/Mg_2SiO_4/MgO ternary material changed the 24 GHz dielectric constant of samples 50.2005, 50.3005 and 50.4005 from 532.8 to 373.3 to 243.1, respectively. The tunability and 24 GHz loss tangent of 50.2005, 50.3005 and 50.4005 remain the same. For different RF applications, certain dielectric constants may be desired. The ternary composites make it possible to engineer the material

with the desired dielectric constant without changing the dielectric loss and tenability.

[0046] Another significant improvement shown in Tables 1-5 is that the materials can also be designed to keep the dielectric constant and tunability the same while decreasing the dielectric loss, which is not exhibited by binary composites. As an example, in Table 1, the 24 GHz dielectric loss tangent of 55.4001 and 55.4005 has been reduced almost by half by changing the percentage of MgO phase in BSTO/Mg_2SiO_4/MgO composite, but the dielectric constant and tunability remain the same. (Specification paragraphs 45-46).

Further support is also shown at least at tables 1-5 of the Specification which provide data related to dielectric constants, tunability and dielectric loss, where the dielectric constant was tailored to desired values by adjusting an amount of only one metal oxide material of the at least two additional metal oxide materials while maintaining the tunability and dielectric loss of the material substantially the same. For example, Table 1 illustrates the following:

TABLE 1

Low and High Frequency Data of BSTO with varying Amounts Mg_2SiO_4 and MgO

BSTO/ Mg_2SiO_4/ MgO	Dielectric Constant (1 MHz)	Dielectric Loss (1 MHz)	Dielectric Constant (10 GHz)	Dielectric Loss (10 GHz)	Dielectric Constant (24 GHz)	Dielectric Loss (24 GHz)	Tunability (2 V/um) (%)	Tunability (4 V/um) (%)	Tunability (6 V/um) (%)	Tunability (8 V/um) (%)
35.2005	503.2	0.0011			396.2	0.0132	4.2	8.8	12.2	
35.2005	374.1	0.0010			300.6	0.0187	3.6	8.7	13.2	
35.3005	245.9	0.0008			213.0	0.0103	3.03	9.1		
40.2005	427.4	0.00065			344.0	0.0148	6.0	13.1	18.5	
40.3005	252.9	0.0008			250.0	0.0145	6.5	14.1	20.0	
40.6005	43.7	0.004			40.2	0.0153	3.4	7.8	11.7	15.2
45.2005	518.9	0.001			425.8	0.0206	8.1	17.2	23.9	
45.5002	129.7	0.0013	107.16	0.0155	106.2	0.0224	7.3	17.7	25.3	31.3
45.5002	134.4	0.0015			114.4	0.0191	9.3	18.2	25.0	30.9
45.5003	133.1	0.0033			129.6	0.0201	7.9	16.6	23.7	29.4
45.5005	111.8	0.00285			100.6	0.019	9.5	17.5	23.8	29.3
45.5501	96.0	0.0013	80.99	0.0118	78.4	0.0232	6.7	16.2	23.7	29.3
45.5502	99.0	0.0024			68.2	0.0266	7.8	15.5	22.1	27.9
45.5503	90.6	0.0021			77.7	0.0178	7.0	15.8	23.0	29.1
45.5505	101.9	0.0023			71.5	0.0162	10.0	18.1	24.8	30.2
50.2005	637.5	0.0008			532.8	0.0359	12.0	24.2	33.0	
50.3005	460.6	0.0008			373.3	0.0357	13.5	26.9	36.0	
50.4005	268.8	0.0006			243.1	0.0353	13.4	25.7	34.3	

TABLE 1-continued

Low and High Frequency Data of BSTO with varying Amounts Mg_2SiO_4 and MgO

BSTO/ Mg_2SiO_4/ MgO	Dielectric Constant (1 MHz)	Dielectric Loss (1 MHz)	Dielectric Constant (10 GHz)	Dielectric Loss (10 GHz)	Dielectric Constant (24 GHz)	Dielectric Loss (24 GHz)	Tunability (2 V/um) (%)	Tunability (4 V/um) (%)	Tunability (6 V/um) (%)	Tunability (8 V/um) (%)
55.4001	400.6	0.00116			362.5	0.0734	26.2	41.8	52.5	59.9
55.4005	437.9	0.00158	404.9	0.0243	362.5	0.0395	24.8	42.2	52.5	59.7
55.0160	102.1	0.002			88.0	0.0165	11.2	17.6	22.6	
55.0560	114.9	0.0021			92.8	0.0244	9.8	18.0	24.4	30.1
55.1060	98.4	0.0019			78.0	0.0254	10.1	18.4	24.4	29.5
45.55*	81.3	0.0014			79.4	0.0185	4.8	12.4	18.9	24.1
55.60**	99.8	0.0011			84.6	0.0188	6.9	13.4	18.4	22.8

*45 wt. % $Ba_{0.45}Sr_{0.55}TiO_3$ and 55 wt. % Mg_2SiO_4
**40 wt. % $Ba_{0.55}Sr_{0.45}TiO_3$ and 60 wt. % MgO

As can be seen from the results of table 1, the dielectric constant was tailored to desired values by adjusting an amount of only one metal oxide material of the at least two additional metal oxide materials while maintaining the tunability and dielectric loss of the material substantially the same.

II. Conclusion

This application is in condition for allowance, which action is respectfully requested. It is respectfully requested that the Examiner call the undersigned if clarification is needed on any matter within this Amendment, or if the Examiner believes a telephone interview would expedite the prosecution of the subject application to completion. Please charge any deficiencies or credit any overpayment to Deposit Account No. 50-5199.

Respectfully submitted,

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